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FINAL REPORT ON
HEAT CAPACITY MAPPING MISSION (HCMM)
NOTIFICATION EFFORTS

October 30, 1980

Prepared for
Office of Space and Terrestrial Applications
National Aeronautics and Space Administration
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SECTION 1. INTRODUCTION



SECTION 1. INTRODUCTION

Data from the Heat Capacity Mapping Mission (HCMM) in the form of images and computer compatible tapes are now available to the general public and the scientific community. To encourage wide use of the HCMM data, especially among the scientific community, special notifications were prepared to inform them about the data's availability, its form, and the procedures for obtaining them. To achieve the widest distribution to the primary audiences of interest, mailings were made to scientists associated with the OSTA Resource Observation Division programs and to scientific and professional societies and journals. Accompanying the notifications to the societies and journals were samples of the HCMM imagery and a description of the image's predominant characteristics. A follow-up survey was completed to determine the effectiveness of the HCMM notifications.

The following sections briefly document the preparation of the mailing lists and the written notifications, including the selection of the images, and the follow-up evaluation activity. The appendices provide detailed lists of the investigators, journals and societies, the notification correspondence, sample HCMM images and descriptions, and the evaluation results.



SECTION 2. CONTRACT ACTIVITIES



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2.1 SELECTION OF RECIPIENTS

The mailing list for notification included selected investigators associated with the Resource Observation Division programs and professional and scientific journals and societies. The investigators who were included are listed in Appendix A: funded investigators from the Non-Renewable Resources, Renewable Resources, and Geodynamic Programs; non-funded investigators from the Non-Renewable Resources Programs; and members of the Space and Terrestrial Applications Advisory Committee on Geodynamics and Geology. To prepare the listing of professional and scientific journals and societies, a preliminary list of societies and journals was generated and mailed to the twelve domestic Principal Investigators (PI's) of the HCMM investigation program for their review. The input of the HCMM PI's assured the widest possible coverage of the societies and journals dealing with the applications and disciplines served by the HCMM mission. Appendix B lists the PI's who were contacted for the review and Appendix C contains the final listing of journals and societies.

2.2 INVESTIGATOR NOTIFICATION

A letter format was used to inform each investigator for the availability of the HCMM data. It contained a brief technical description of the satellite, its sensors, and the mission characteristics in addition to a description of the data, its format, and how to obtain it. A sample of the letter to the investigators is included as Appendix D. Mailings to the investigators were completed in May 1980.

2.3 JOURNAL AND SOCIETY NOTIFICATIONS

Sixty unique HCMM images, carefully chosen on the basis of geographical area, image quality, and percentage of cloud cover, were selected for



reproduction. These images were reproduced and supplied by the National Space Science Data Center (NSSDC). In most cases, a visible image was paired with an infrared image to demonstrate HCMM's capability of distinguishing terrestrial characteristics. Each image pair was then analyzed in order to provide a brief written description of the predominant characteristics.

The mailings to the journals and societies included a pair of images with written descriptions and a technical description of the HCMM mission. In preparing the images for distribution, care was taken to provide each professional and scientific journal and society with a set of images which was appropriate to the fields of interest and expertise of their readers and members. Mailings to the journals and societies were completed in June 1980. A sample of the notifications mailed to the journals and societies is provided in Appendix E, and examples of the HCMM images are included in Appendix F.

2.4 FOLLOW-UP EVALUATION

To determine the effectiveness of the HCMM data notification activity, a questionnaire was mailed to each journal and society which received a notification package. The questionnaire was designed to survey the organization's regarding how, if at all, the images were used. A sample of the questionnaire which was distributed in September 1980 is shown in Appendix G along with the statistical results of the survey.

Results from the questionnaire indicate that the majority of journals and societies were pleased with the HCMM information and planned to use it in a publication. The publication of this information provides wide distribution in the professional community and provides broad coverage within related fields of interest.

In addition, information was provided by the National Space Science Data Center (NSSDC) regarding the number of requests for HCMM data. This



information was correlated on a monthly basis to reveal any changes in data requests which may be attributable to the notification efforts. The information from the NSSDC is also provided in Appendix G.

However, the results do not yield any significant information other than background data. Since the mailings were completed in May - July, it is premature to be observing any significant increase in HCMM requests from the NSSDC. Many of the journals and societies have indicated that the information will be published in late 1980 and early 1981, and therefore, an increase of data requested from the NSSDC should become apparent in mid-1981.

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APPENDIX D. INVESTIGATOR NOTIFICATION LETTER



National Aeronautics and
Space Administration

Washington, D C
20546

Reply to Attn of ERS-2

Dear Sir:

The purpose of this letter is to inform you and your colleagues of the current availability of observational data from the Heat Capacity Mapping Mission (HCMM). The HCMM satellite was launched April 26, 1978 and placed in a high inclination (97.6°) near circular orbit at an altitude of 620km. The satellite is carrying a scanning radiometer which obtains broadband measurements of spectral radiance in the visible (0.55-1.1 micrometer wavelength) and thermal infrared (10.5-12.5 micrometer) portions of the electromagnetic spectrum. The ground resolution of the radiometer is 600x600m in the thermal channel and 500x500m in the visible channel immediately beneath the spacecraft (i.e. at nadir). The field of view of the radiometer is mechanically rotated through a scan angle of 60° producing imagery with a nominal ground swath width of 720km.

HCMM was designed to experimentally evaluate the usefulness of remotely sensed surface temperature measurements for a wide variety of applications in geology, botany, ecology, hydrology, and meteorology. The orbital characteristics of the satellite permit repetitive observations of mid-latitude regions over the course of the diurnal heating cycle. Repetitive coverage at mid-latitudes occurs at times of maximum and minimum surface temperature (roughly 1:30 p.m. and 2:30 a.m. local time, respectively). This type of coverage is optimal for observing temporal and spatial thermal contrast within surficial materials. HCMM thermal infrared measurements can be used to examine the amplitude of day/night variations in surface temperature on a regional basis. They can also be used to estimate the apparent thermal inertia of surficial cover materials.


Because HCMM is an experimental mission, it is not designed to obtain global coverage of the earth's surface. The HCMM satellite does not possess an onboard tape recorder system. Consequently, it was only able to obtain useful scientific data when within range of certain ground receiving stations. HCMM data has been acquired over extensive areas of North America, Europe, and Australia.

Processing and reduction of HCMM data are still in progress. Current plans call for HCMM-related data processing to be completed during the current calendar year. The HCMM Data Users Guide, associated catalogs, and data in both image and digital format, are now available from the National Space Science Data Center. HCMM imagery can be obtained in the form of positive and negative photographic prints and transparencies. Requests for these materials should be addressed to:

National Space Science Data Center
Code 601.4
NASA Goddard Space Flight Center
Greenbelt, MD 20771

Questions concerning the availability of HCMM and other types of space acquired data related to earth resource investigations should be referred to Mr. Bernard Nolan or myself here at NASA Headquarters.

Sincerely,



Pitt G. Thome
Director, Resources
Observation Division

APPENDIX E. SAMPLE JOURNAL AND SOCIETY NOTIFICATION



National Aeronautics and
Space Administration

Washington, D C
20546

Reply to Attn of

ERS-2

Dear Sir:

In an effort to notify the scientific and professional communities of the availability of data from the Heat Capacity Mapping Mission (HCMM), the enclosed abstract and HCMM images are being sent to you for public release.

The HCMM satellite carries a two channel scanning radiometer which views the earth's surface and obtains simultaneous measurements of spectral radiance in the visible and thermal infrared portions of the electromagnetic spectrum. The data collected by the satellite can be viewed in image format. From an orbital altitude of 620 km, the swath of coverage along with satellite's ground track is 720 km wide. The spatial resolution of HCMM imagery is given in terms of the dimensions of individual picture elements (pixels) at the ground surface. The pixel resolution of the HCMM imagery is nominally 600 x 600 m in the infrared channel (10.5 - 12.5 micrometer wavelength region), and 500 x 500 m in the visible channel (0.55 - 1.1 micrometer region).

Thermal infrared surveys performed by the HCMM can be used to map areal variations in apparent surface temperature during daytime and nighttime periods. Successive passes of the satellite over the same area within a single 24 hour period can be used to measure the apparent thermal inertia of surficial materials. The data obtained by this satellite mission are being employed in a variety of experimental scientific investigations. Some of the objectives of these studies are:

- (a) discrimination of different types of rocks and soils
- (b) monitoring stress in different types of vegetative species
- (c) monitoring areal and temporal variations in soil moisture

- (d) predicting water runoff from snow fields in response to seasonal changes in regional weather conditions
- (e) monitoring thermal effluents, currents, and eddies within large bodies of water
- (f) measuring the size and radiant thermal energy associated with urban heat islands

As you can see, the HCMM data is being used in a truly multidisciplinary fashion by investigators from a wide variety of scientific fields. It is our intention to notify the widest possible cross section of the scientific and professional communities of the current availability of these data. Information concerning the detailed characteristics of this satellite mission, and procedures for obtaining the data is described in the accompanying abstract. I would encourage you to publicize the HCMM information and imagery enclosed in this mailing in whatever manner you deem appropriate. The HCMM has collected a truly unique set of experimental data which must be fully analyzed before its significance can be fully appreciated.

If you have any questions concerning the enclosed materials please feel free to contact me personally.

Very truly yours,

A handwritten signature in black ink that reads "Mark Settle". The signature is written in a cursive, slightly slanted style.

Mark Settle

/sle

TERRESTRIAL INFRARED REMOTE SENSING
DATA FROM THE
HEAT CAPACITY MAPPING MISSION

Abstract

The Heat Capacity Mapping Mission (HCMM) is an experimental space project sponsored by NASA's Office of Space and Terrestrial Applications. The HCMM satellite was launched April 26, 1978 and placed in a high inclination (97.6°), near circular orbit at an altitude of 620km. The satellite is carrying a scanning radiometer which obtains broadband measurements of spectral radiance in the visible (0.55-1.1 micrometer wavelength) and thermal infrared (10.5-12.5 micrometer) portions of the electromagnetic spectrum. This instrument views the surface of the earth as it passes beneath the satellite and obtains simultaneous measurements of reflected solar radiation and emitted thermal radiation in its visible and infrared channels, respectively.

HCMM was designed to experimentally evaluate the usefulness of remotely sensed surface temperature measurements for a wide variety of applications in geology, botany, ecology, hydrology, and meteorology. The orbital characteristics of the satellite permit repetitive observations of mid-latitude regions over the course of the diurnal heating cycle. Repetitive coverage at mid-latitudes occurs at times of maximum and minimum surface temperature (roughly 1:30 p.m. and 2:30 a.m. local time, respectively). This type of coverage is optimal for observing temporal and spatial thermal contrast within surficial materials. HCMM thermal infrared measurements can be used to examine the amplitude of day/night variations in surface temperature on a regional basis. They can also be used to estimate the apparent thermal inertia of surficial cover materials.

The field of view of the HCMM radiometer is mechanically rotated through a scan angle of 60° producing imagery with a nominal swath width of 720km. The ground resolution of the radiometer is 600 x 600 meters in the thermal channel and 500 x 500 meters in the visible channel immediately beneath the spacecraft (i.e. at nadir). Data obtained in the two channels can be spatially cross registered to an accuracy of 0.2 resolution elements or better. Measurement precision in the two channels is limited by the analog telemetry system to a Noise Equivalent Radiance (NER) of 0.2 mw/cm^2 in the visible and a Noise Equivalent Temperature Difference (NEDT) of 0.4°K at 280°K in the thermal infrared.

Because HCMM is an experimental mission, it is not designed to obtain global coverage of the earth's surface. The HCMM satellite does not possess an onboard tape recorder system. Consequently, it was only able to obtain useful scientific data when within range of certain ground receiving stations. HCMM data have been acquired over extensive areas of North America, Europe, and Australia.

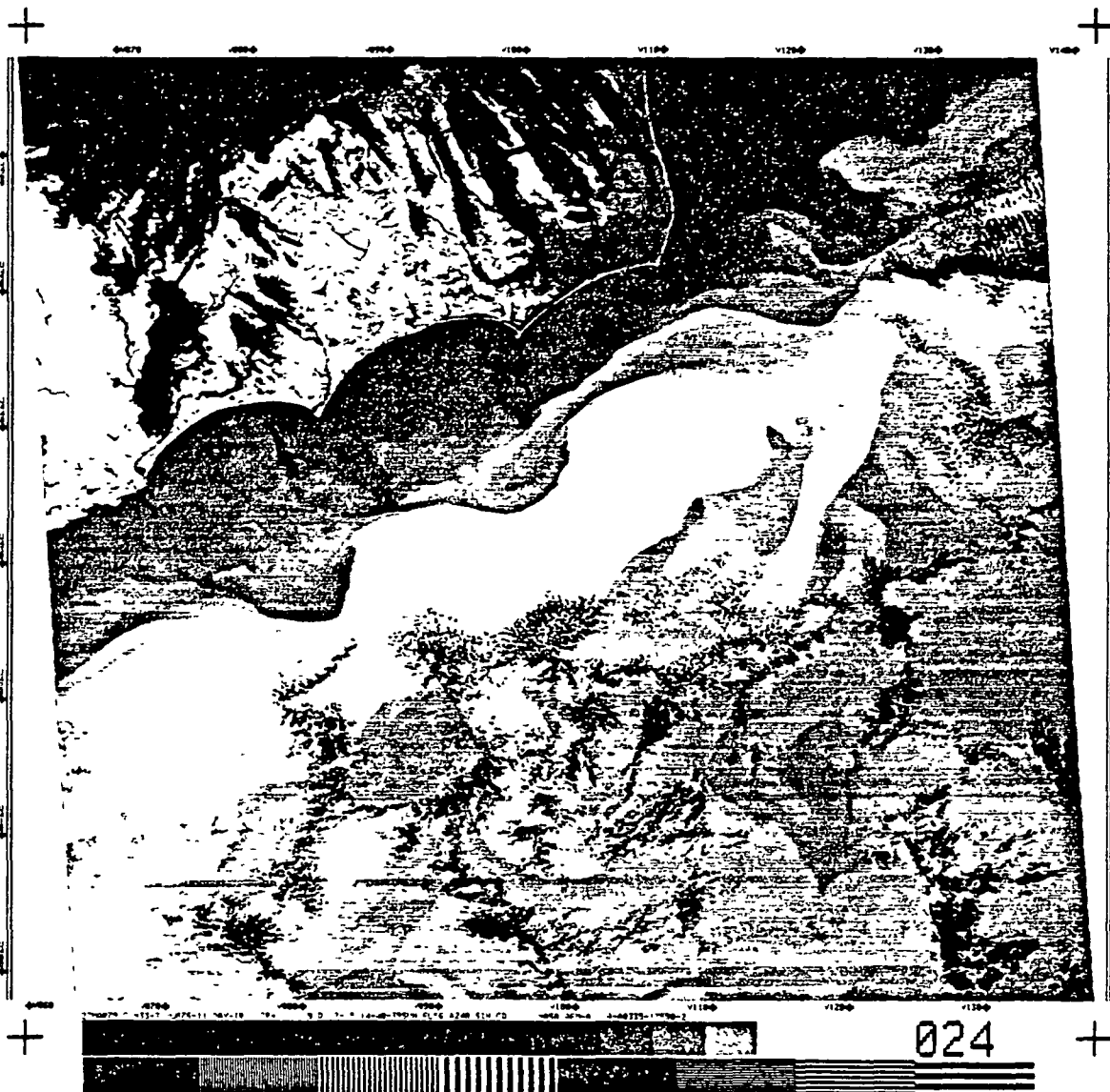
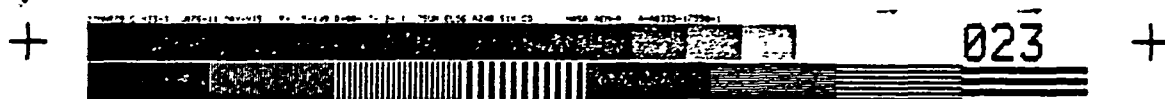
Processing and reduction of HCMM data are still in progress. Current plans call for HCMM-related data processing to be completed during the current calendar year. The HCMM Data Users Guide, associated catalogs, and data in both image and digital format, are now available from the National Space Science Data Center. HCMM imagery can be obtained in the form of positive and negative photographic prints and transparencies. Requests for these materials should be addressed to:

National Space Science Data Center
Code 601.4
NASA Goddard Space Flight Center
Greenbelt, Md. 20071

This HCMM daytime thermal infrared scene of the Carolina coast and coastal waters was obtained March 27, 1979. The most striking oceanographic feature is the Gulf Stream, a western boundary current. Note the meanders forming north of Cape Hatteras. The coast below the outer banks is a compound cusped shoreline. The Albemarle Sound and the Pamlico Sound separate the swamp lowland and salt marshes from the barrier shoreline of the Outer Banks.

In this image, the cooler elements appear as the darkest objects, and the warmer elements as the lightest objects. Therefore, the cloud cover appears as black patches.

The scale is about 1:4,000,000. (Image courtesy of the National Science Data Center.)



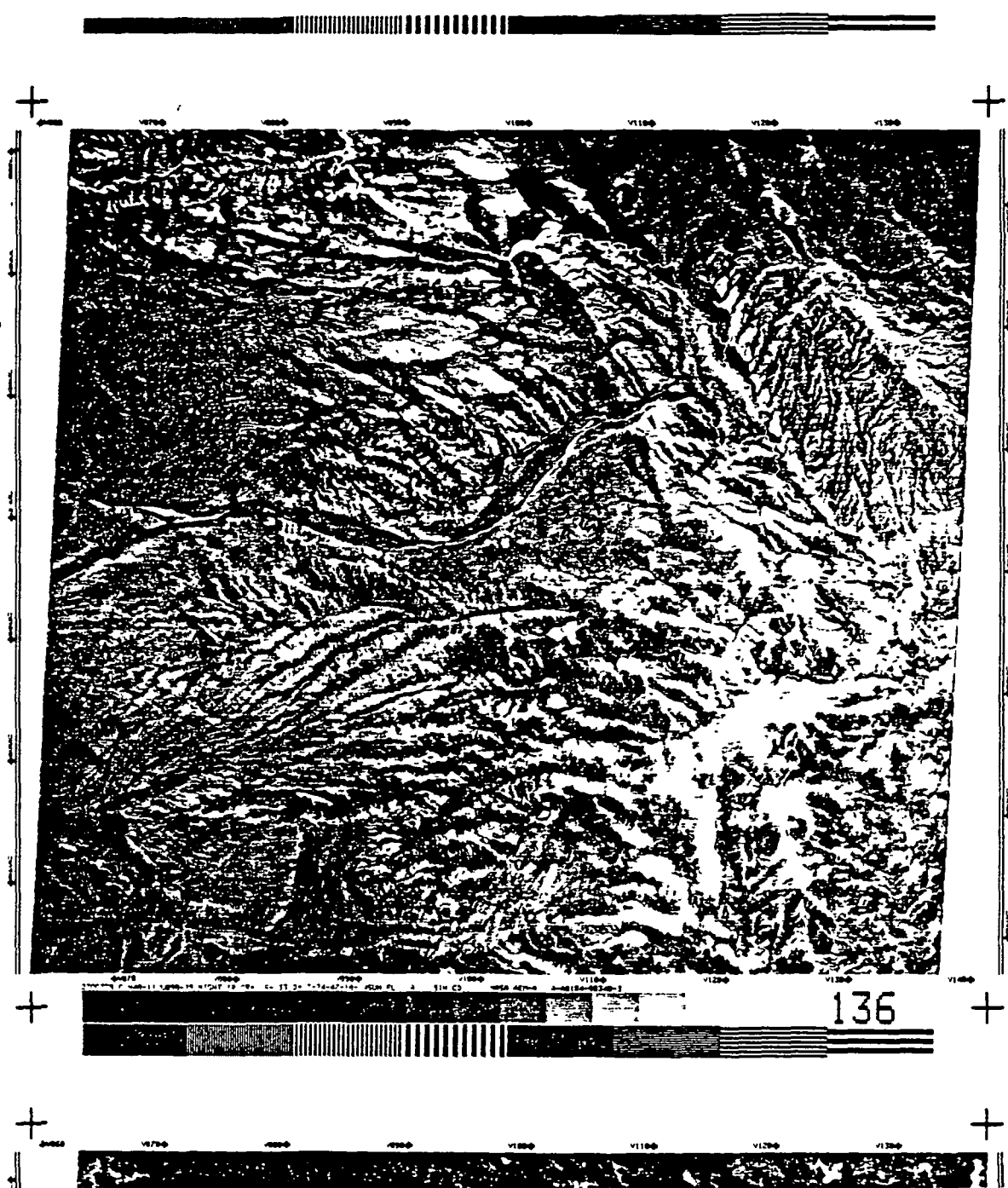
APPENDIX F. SAMPLE HCMM IMAGES

This nighttime thermal infrared image of the central United States was obtained October 27, 1978, and quite excellently delineates the drainage patterns of this agriculturally developed area. In this image, the cooler elements appear as the darkest objects, and the warmer elements as the lightest objects.

The major riverway in the scene is the Missouri River. Branching off the Missouri River, in the lower right part of the scene, is the Kansas River. The river that appears to bisect the scene is the Platte River, which winds its way through Nebraska. Its northern branch, seen along the left side of the image, borders the Sand Hill region. Dune patterns shaped by the prevailing winds are discernible in this image.

This image covers two primary agricultural areas. The right side of the scene, bordering on eastern Kansas, Nebraska, South Dakota, and western Iowa and Missouri is almost totally cleared and cultivated. The left side of the image, central Kansas, Nebraska, and South Dakota, are primarily cattle grazing areas.

The scale is about 1:4,000,000. (Images courtesy of the National Space Science Data Center.)



This nighttime thermal infrared HCMM scene was obtained September 2, 1978. The image is centered on northern Utah, Nevada, and southern Idaho. In this image the cooler elements appear as the darkest objects, and the warmer elements as the lightest objects.

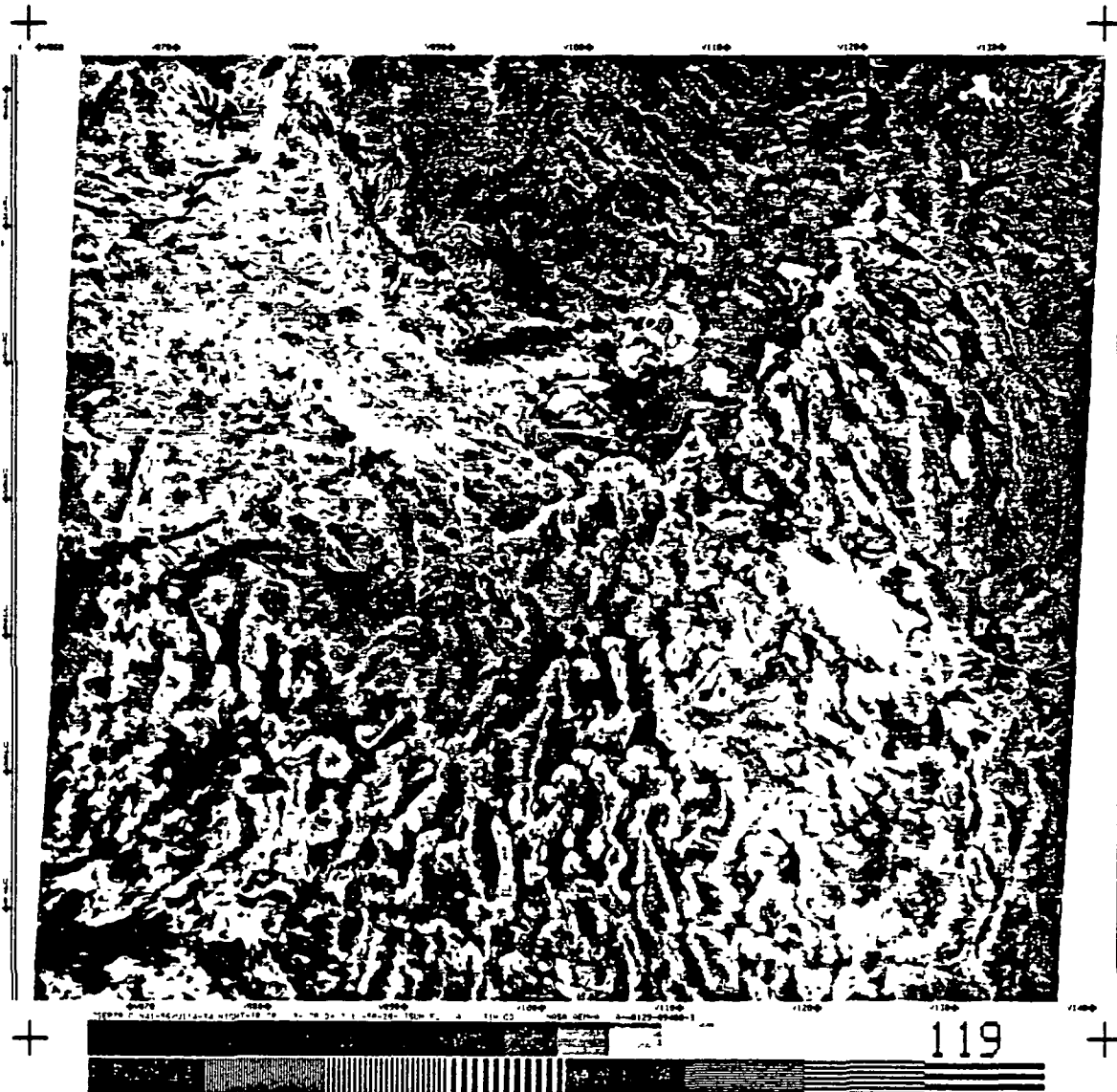
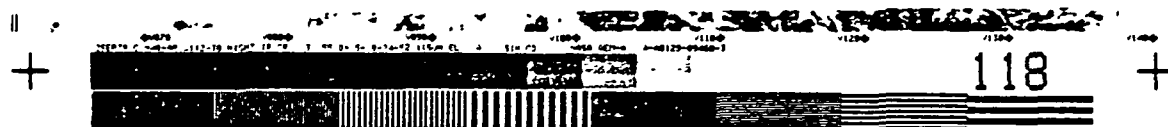
The most obvious feature on the scene is the Great Salt Lake, which is a remnant of the huge Pleistocene, freshwater Lake Bonneville. The geology of the area is dominated by the Basin and Range Province, consisting of uplifted mountains blocks with steep-sided, downfaulted valley troughs.

Yellowstone National Park appears in the upper right hand corner of the scene. The geyser areas appear as light colored dots but should not be confused with the lakes in the area. To the south of Yellowstone are the Grand Teton Mountains, a tilted Precambrian fault block.

The wide dark area north of the Great Salt Lake is the Snake River Plains - a vast expanse of lava flows of Tertiary and Quaternary age. Areas of exposed basaltic lava, which includes the Craters of the Moon National Monument, appear as large gray patches on the darker background of the Snake River Plains. To the northwest lies the Idaho Rocky Mountains, expressed in a series of parallel ranges that are bounded by normal and/or thrust faults.

The "cold" black patches on the left half of the scene are clouds.

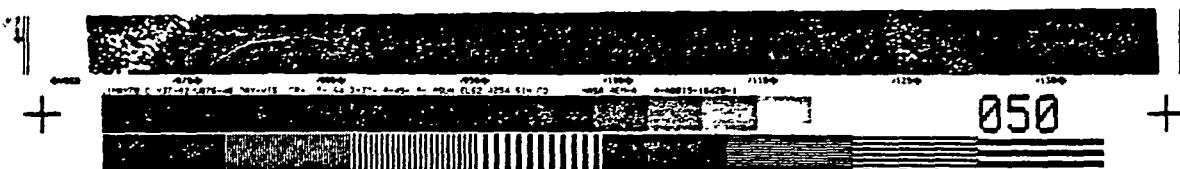
The scale is about 1:4,000,000. (Images courtesy of the National Space Science Data Center.)



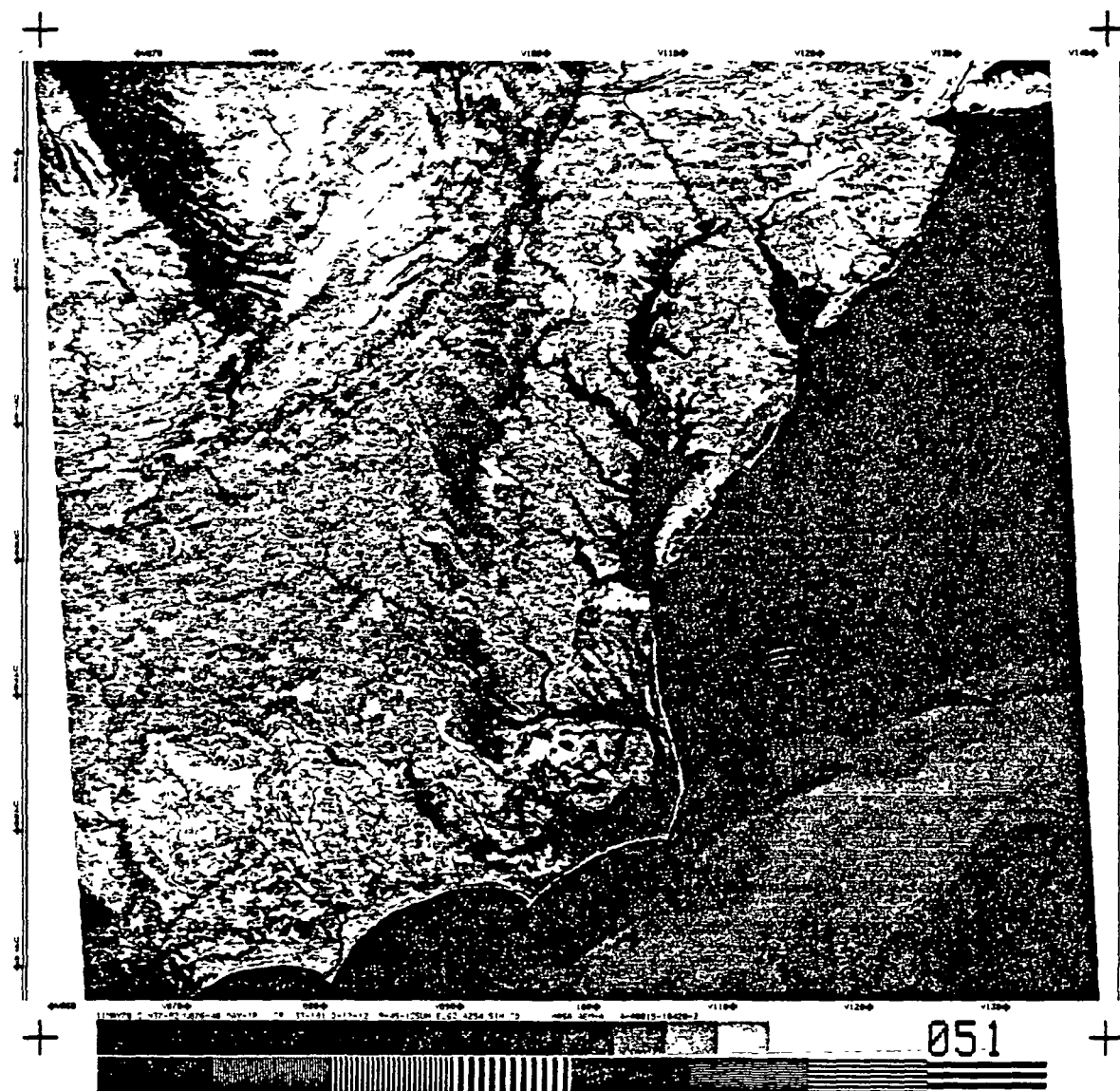
This HCMM daytime thermal infrared scene of the mid-Atlantic coast and coastal waters was imaged May 11, 1978. The Gulf Stream, a Western boundary currents, and associated eddies which form north of Cape Hatteras are distinguishable oceanographic features. The lower Atlantic coastline is a compound cusped shoreline consisting of Long and Onslow Bays. The coastal plain, piedmont province, and Appalachians are all represented in this image.

In this image, the cooler elements appear as the darkest objects, and the warmer elements as the lightest objects. Therefore, the cloud cover appears as black patches, and cities appear as bright patches in the scene. The Great Dismal Swamp is particularly distinguishable as the darkened area below Norfolk.

The scale is about 1:4,000,000. (Image courtesy of the National Space Science Data Center.)



050

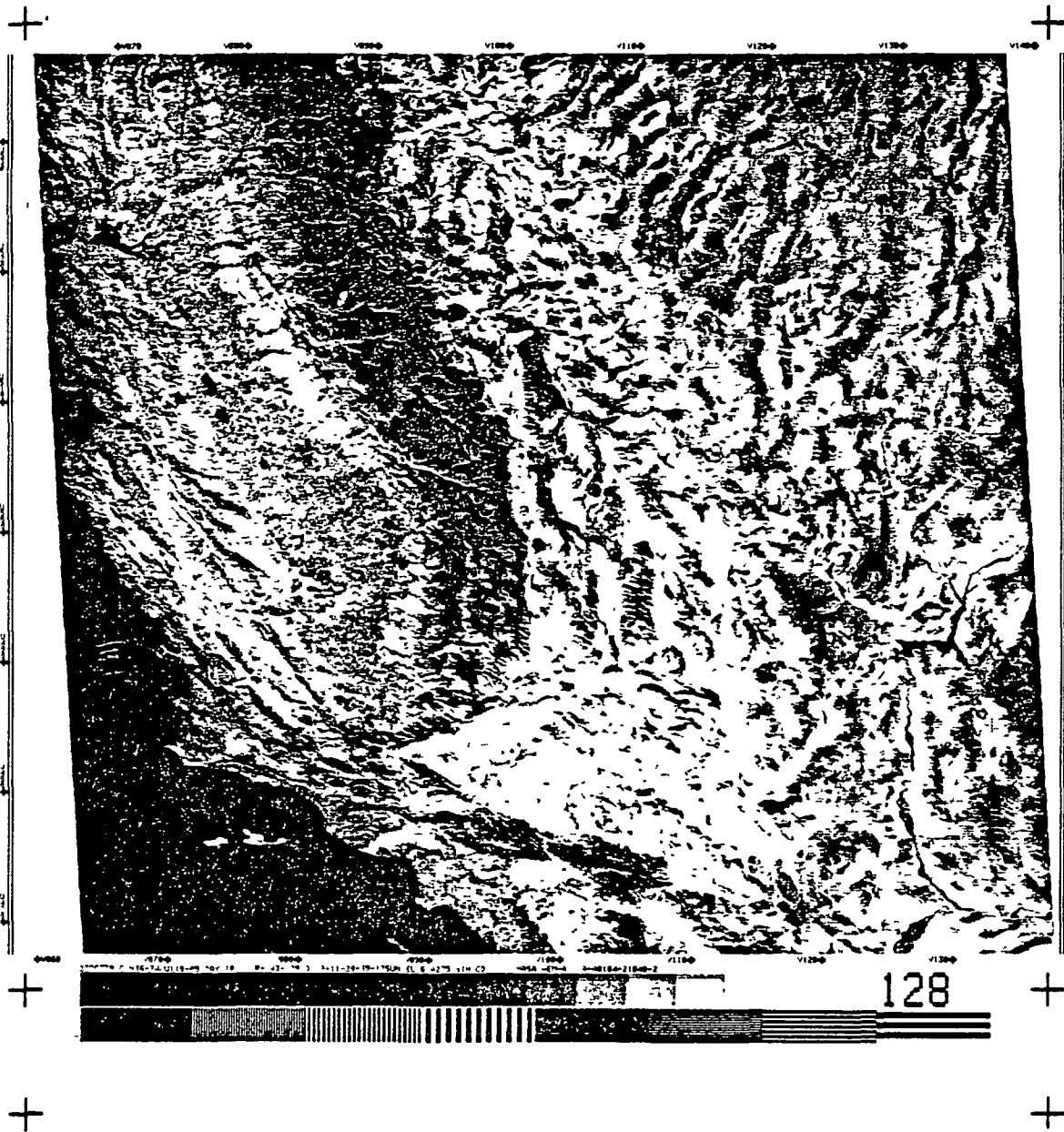


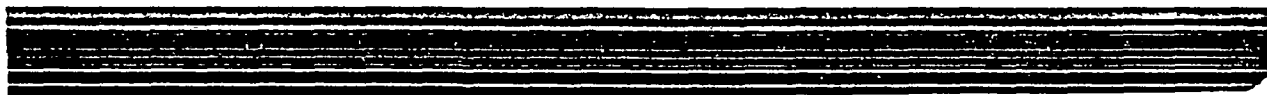
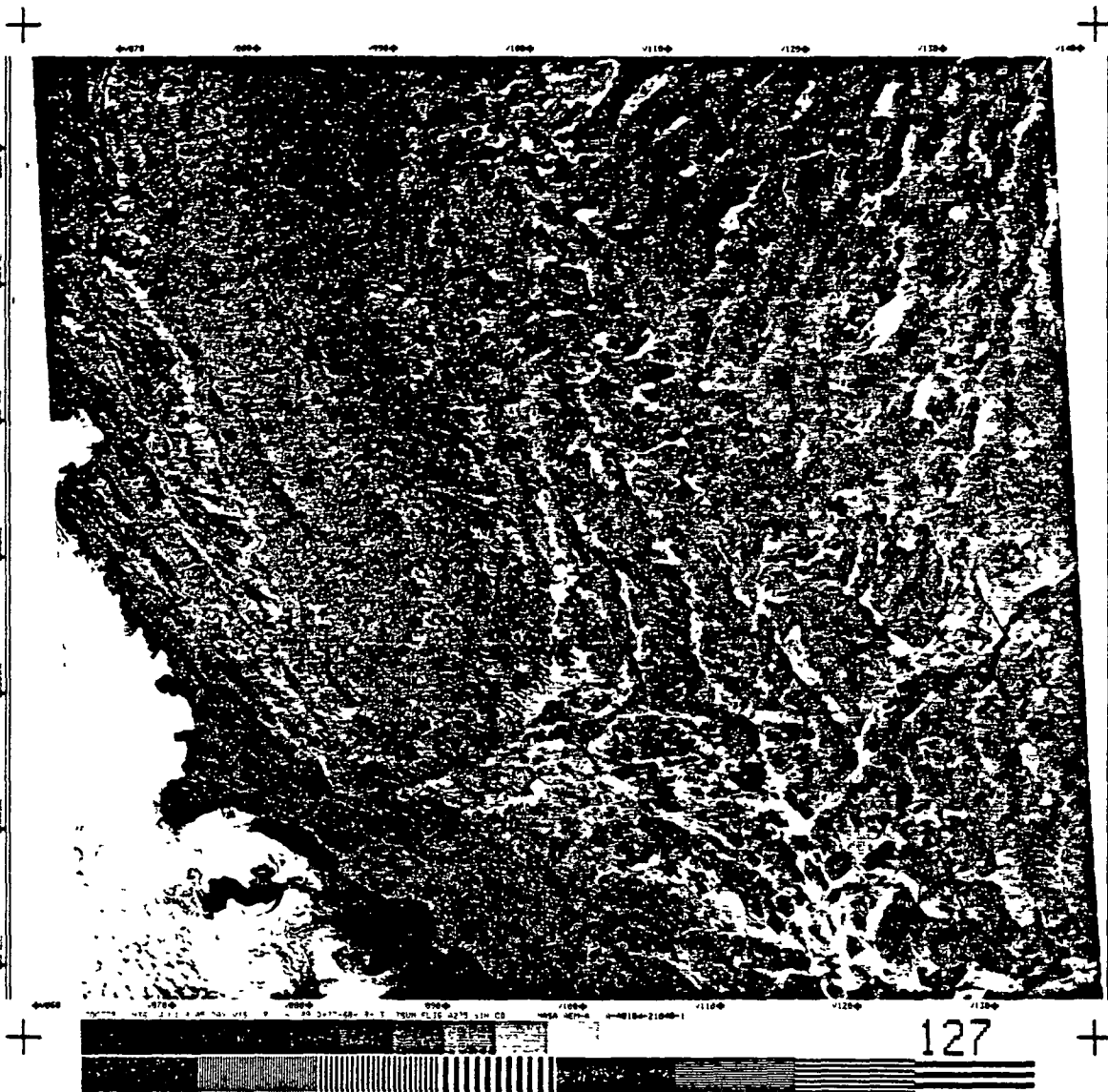
051

On October 27, 1978, HCMM obtained this daytime thermal infrared and visible coverage of California, Nevada and western Arizona. In the thermal IR image, the cooler elements appear as the darkest objects, and the warmer elements as the lightest objects. Therefore, the cloud cover appears as black patches. The bright white triangular area in the lower center is the Mojave Desert, bounded on the southwest by the San Andreas Fault and the northwest by the Garlock fault. The Coast Range extends along the Pacific Coast and Sierra Nevadas are the dark band extending down to the left of center. Between these are the San Joaquin Valley, particularly distinguishable in the Thermal IR band.

In the upper right is the Basin and Range region, a result of extensive block faulting, characterized by a series of short, steep-sided ridges separated by alluvium-filled basins.

The scale is about 1:4,000,000. (Images courtesy of the National Space Science Data Center.)



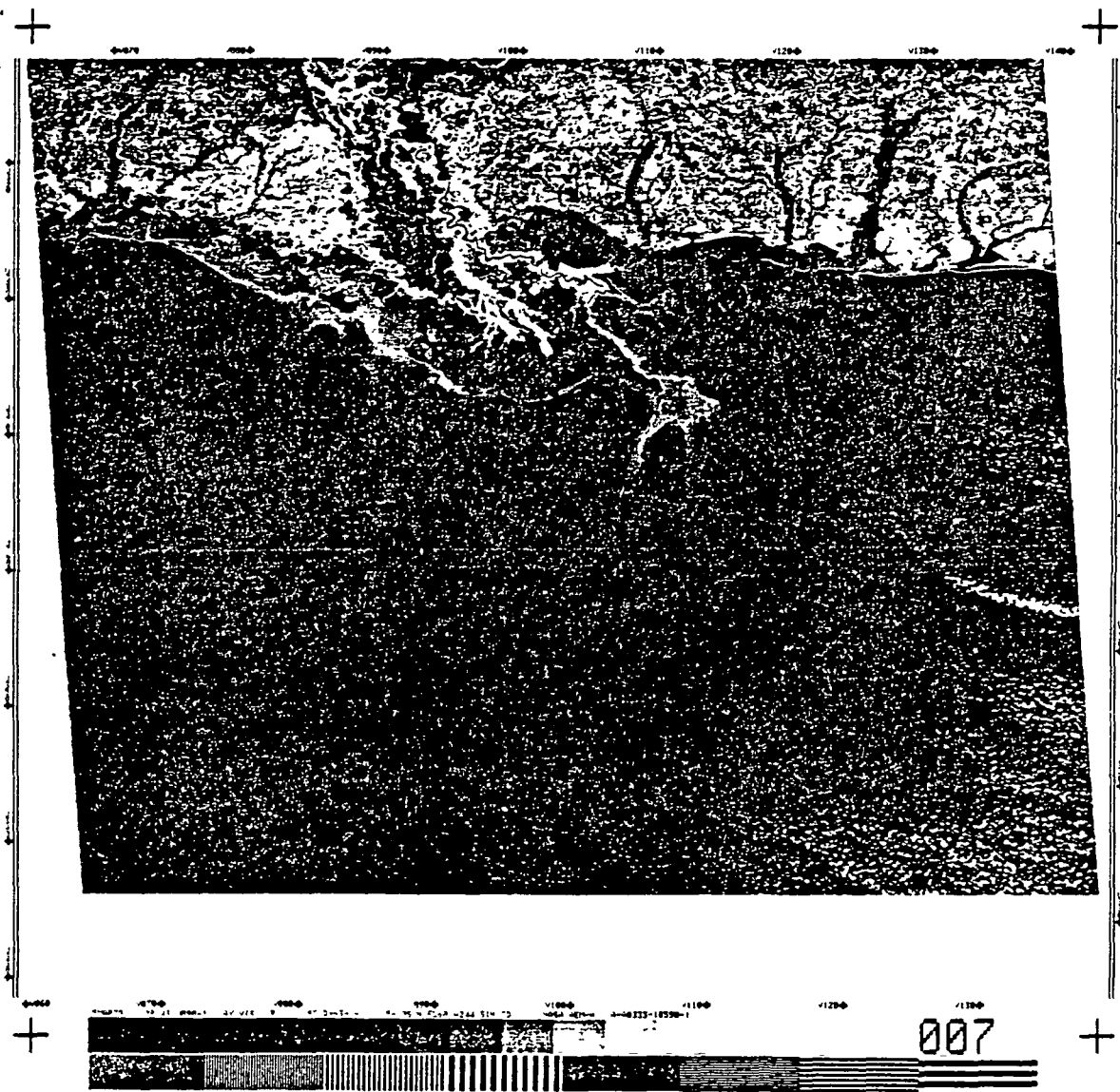


These daytime HCMM images taken March 25, 1979, extend from Port Arthur, Texas to Pensacola, Florida. The most prominent feature in the scene is the Mississippi Delta. The cloud of mud and silt coloring the water around the river mouth in the visible image graphically illustrates the process of delta building. The Mississippi River pours more than a million tons of sediment into the Gulf every day, extending banks of mud, sand and clay out over the continental shelf. The Mississippi River Delta reveals a series of abandoned distributaries, each with its own subdelta, forming a complex lobate delta. The shape of a delta is controlled in a complex way by the balance between erosion and sediment transport along the coast and the rate of sediment supply. The sediment supply from the Mississippi River exceeds the capacity of the Gulf of Mexico to transport it, hence the "birdfoot" shape.

The thermal infrared image shows the mixing process of the cooler waters of the Mississippi pouring into warm waters of the Gulf of Mexico. In this image the cooler elements appear as the darkest objects and the warmer elements as the lightest objects. Therefore, the cloud cover appears as black patches. New Orleans, on the shores of Lake Pontchartran, is quite discernible in the thermal infrared image. Other cities also stand out in this image; Mobile, Alabama, Pensacola, Florida, Baton Rouge and Lake Charles, Louisiana, and Port Arthur, Texas are the most obvious.

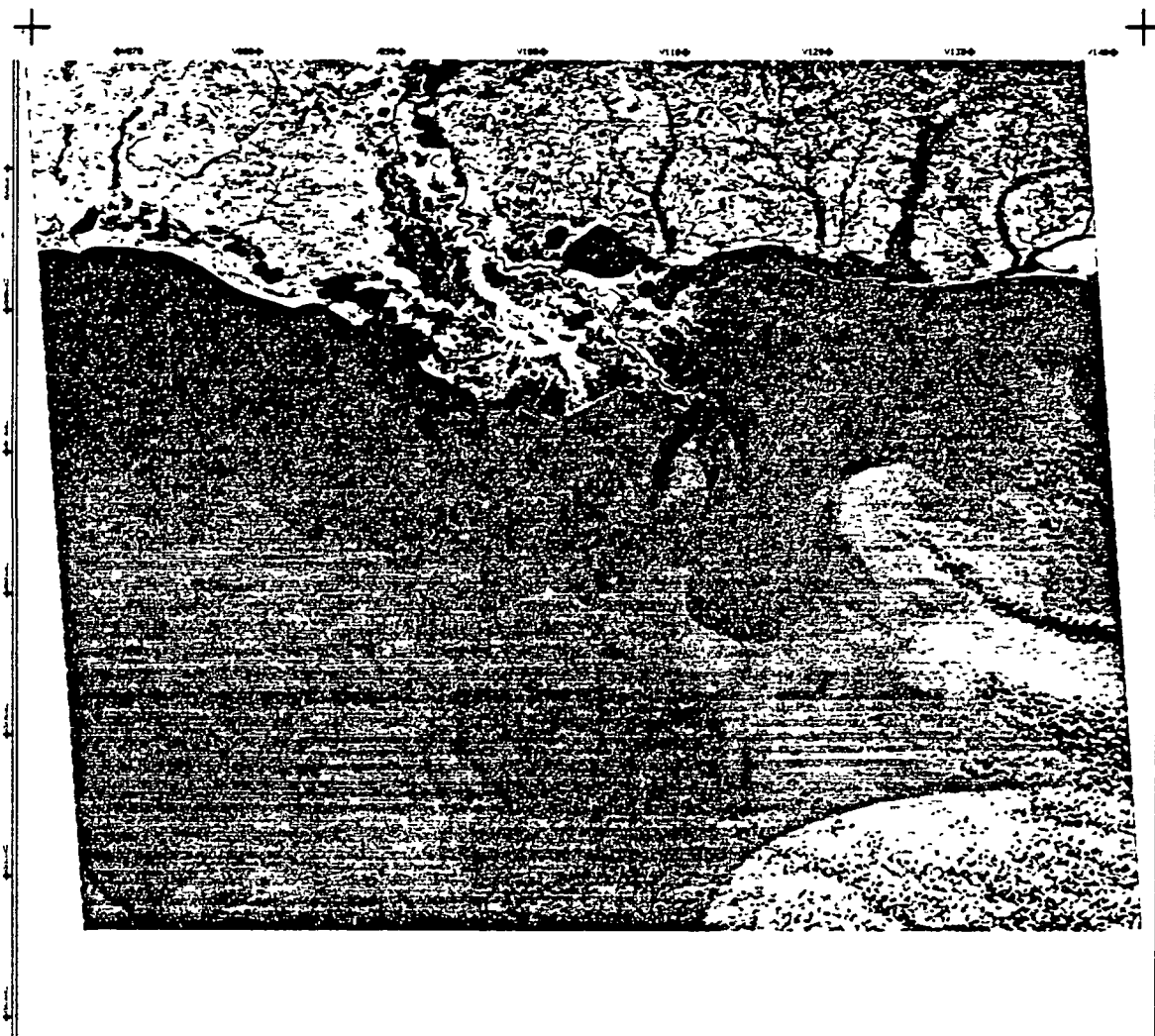
Oil Fields are found throughout this region in association with a swarm of subsurface salt domes. Surface expressions of several domes can be discerned in both the thermal infrared and visible image.

The scale is about 1:4,000,000. (Images courtesy of the National Space Science Data Center.)





007



008

This nighttime thermal infrared image of southwest America was taken May 12, 1978. The scene extends from the Baja Peninsula on the lower left, northward through the desert to Lake Mead, and westward through the Grand Canyon and the Colorado Plateau. In the thermal IR image the cooler elements appear as the darkest objects, and the warmer elements as the lightest objects.

The Grand Canyon is a striking feature in the image. The canyon is incised in essentially horizontal Paleozoic sedimentary rocks. The very dark area to the north of the canyon is the Kaibab Plateau, an upwarped feature. To the south of the canyon lies the San Francisco volcanic field, and to the west lies the Mount Trumbull volcanic field. These late Tertiary and Quaternary volcanics are evidenced by the very dark peaks and the faint light cinder cones discernable in this image.

To the west of the Grand Canyon, the Colorado River flows into Lake Mead, created by Hoover Dam. South of Lake Mead, the Colorado was dammed again resulting in Lake Mojave. The dark area to the east of Lake Mojave are the ridges of Arizona's Black Mountains. Grand Wash Fault, the boundary between the Colorado Plateau and the Basin and Range province, can be recognized in the upper left side of the image.

Along the Colorado and Gila Rivers, irrigated areas stand out as dark bands in contrast to the surrounding arid region of the Great Basin. This geologic province is marked by block faulted mountains separated by broad alluvium-filled valleys.

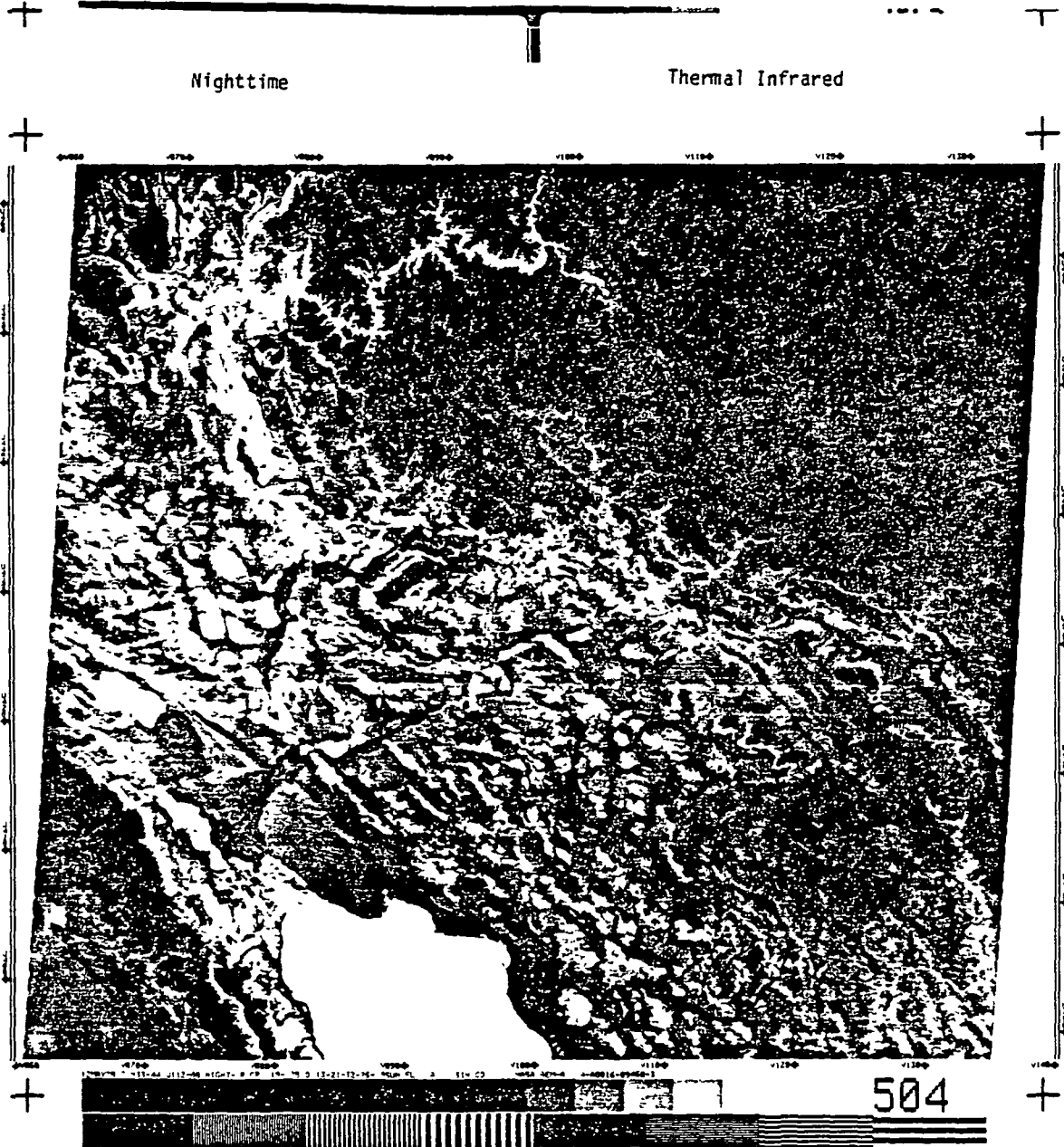
To the west of the Colorado-Gila River intersection is the Salton Sea. South of the Salton Sea is the Imperial Valley, an agricultural area made possible by irrigation canals dug from the Colorado River. A distinguishable line of demarcation identifies the United States-Mexico border, due to differential agricultural and land use practices. Mexicali is the bright "urban heat island" on the Mexican side of the border. The salt flats of Laguna Salada, sand dunes, saline playas, and extremely arid alluvial deposits account for the very bright area southwest of Mexicali.

When the Colorado River reaches the Gulf of California it forms a massive alluvial fan. This delta is bordered on the east by the Gran

Desierto. Careful examination of the image will show the elongated patterns of the dunes. On the northeast shore of the Gulf of California lies the Pinocate Volcanic Field. The cinder cones of this area stand out as black dots on the light gray nearly circular feature.

To the east of the Gulf of California is a continuation of the Basin and Range province, an area of block faulting in which the valleys are alluvium-filled grabens. The pronounced northwest-to-southeast alinement of these mountains suggests that they are related to the processes that created the Gulf of California. This is attributed to spreading beneath the East Pacific Rise, the area that separates northwestward-moving Pacific Plate from the westward-moving North American Plate. The Baja Peninsula is part of the Pacific Plate, and it is believed it will eventually be drawn away from the California mainland as the Gulf of California extends northward to join the Pacific Ocean.

The scale is about 1:4,000,000. (Images courtesy of the National Space Science Data Center.)



These daytime HCMM images of northeast America were obtained May 11, 1978. The scene extends from the Long Island Sound and the Hudson River, in the lower right hand corner of the image, through the Appalachian Mountains, the Great Lakes region, and north to the Laurentian Highlands of Canada. In the thermal IR image, the cooler elements appear as the darkest objects and the warmer elements as the lightest objects.

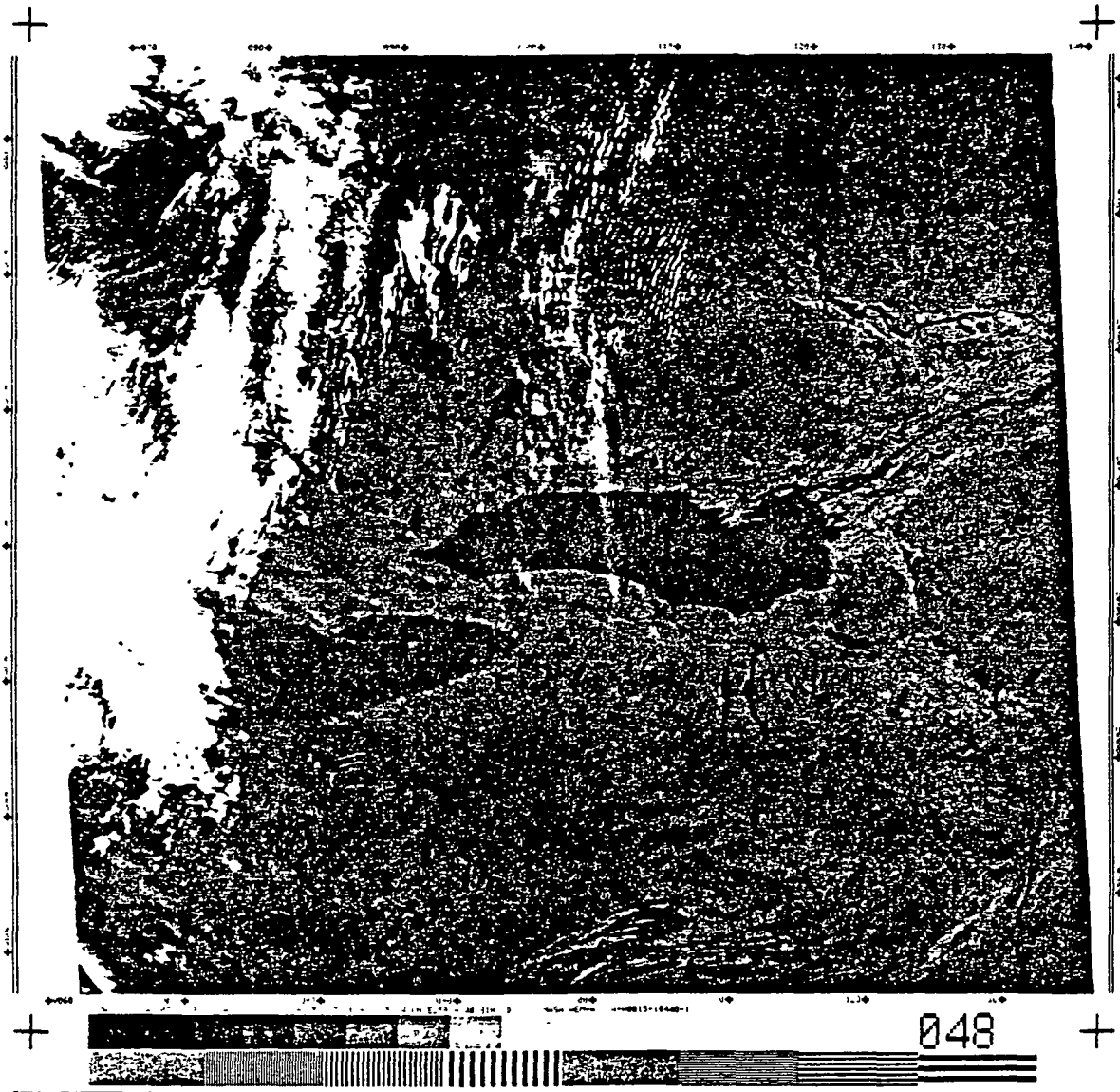
Much of the area's present physical features are a result of the repeated glacial advances and retreats of the Pleistocene. The Great Lakes were carved chiefly by local glacial excavation of the floors of broad preglacial valleys, while the Finger Lakes were probably produced by enlarging pre-existing stream valleys with ice, drift, and meltwaters.

Several geologic provinces are represented in this scene. On the bottom of the image, the characteristic fold and overthrust ridge belt of the valley and ridge province of the Appalachians can be observed. To the northeast lie the Catskill Mountains and the Hudson River. Along the right side of the images, the Adirondack Mountains can be observed as the dark (heavily forested) area. The Adirondacks are the outlier of the Canadian Shield. To the north are the St. Lawrence Lowlands, a great structural trough. The border between the Adirondacks and the St. Lawrence Lowlands are marked by extensive faulting. North of the Ottawa River lies the Laurentian Highlands. Much of the region northwest of the Great Lakes is obscured by clouds which appear as a black patch on the thermal infrared image and a white patch on the visible image.

The scale is about 1:4,000,000. (Images courtesy of the National Space Science Data Center.)

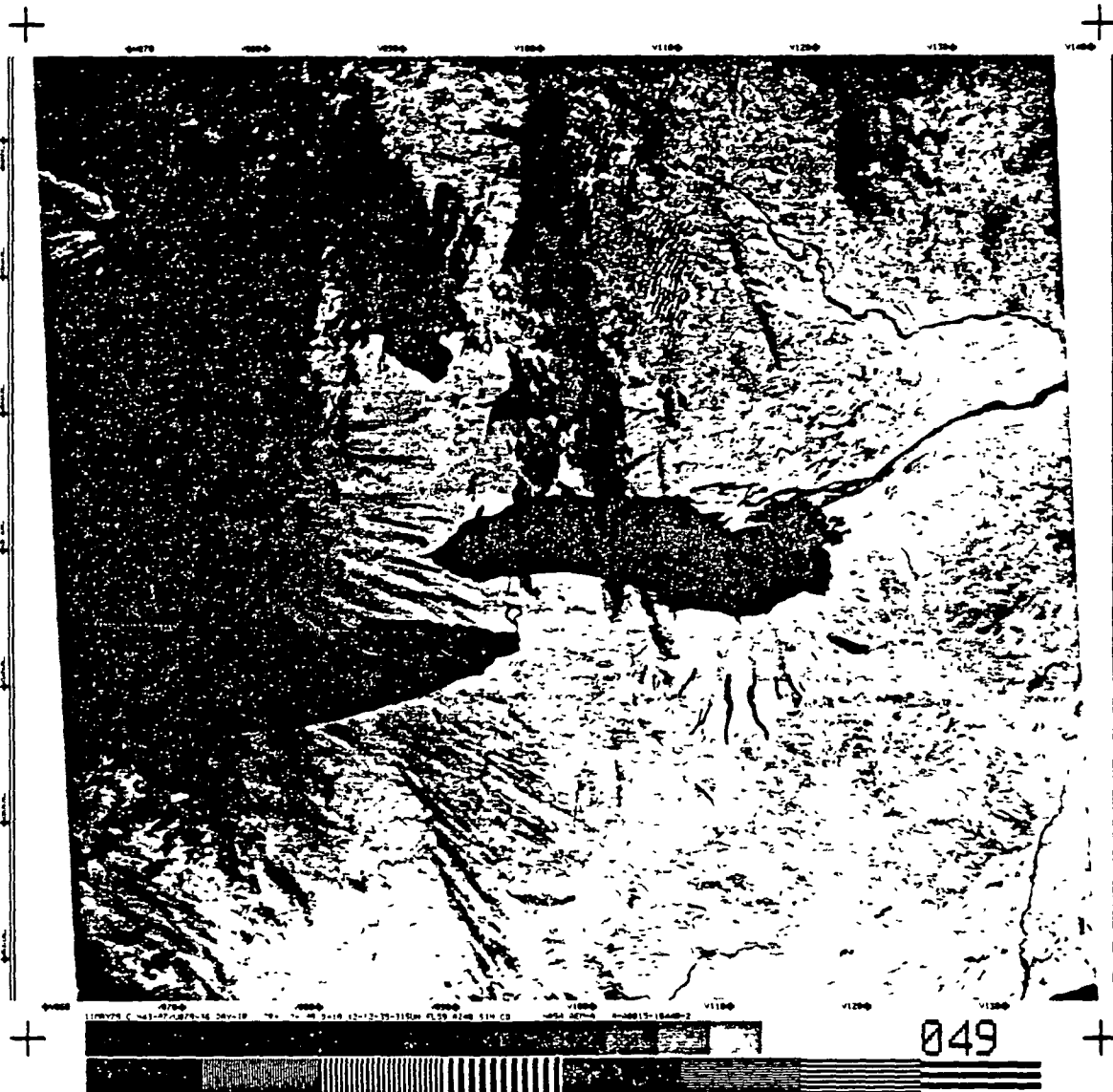
Daytime

Visible



Daytime

Thermal Infrared



This HCMM nighttime thermal infrared image of the Sahara Desert in Algeria was obtained July 21, 1978. Nighttime thermal infrared images are particularly useful in recognizing geologic structural features. In this image, the cooler elements appear as the darkest objects and the warmer elements as the lightest objects.

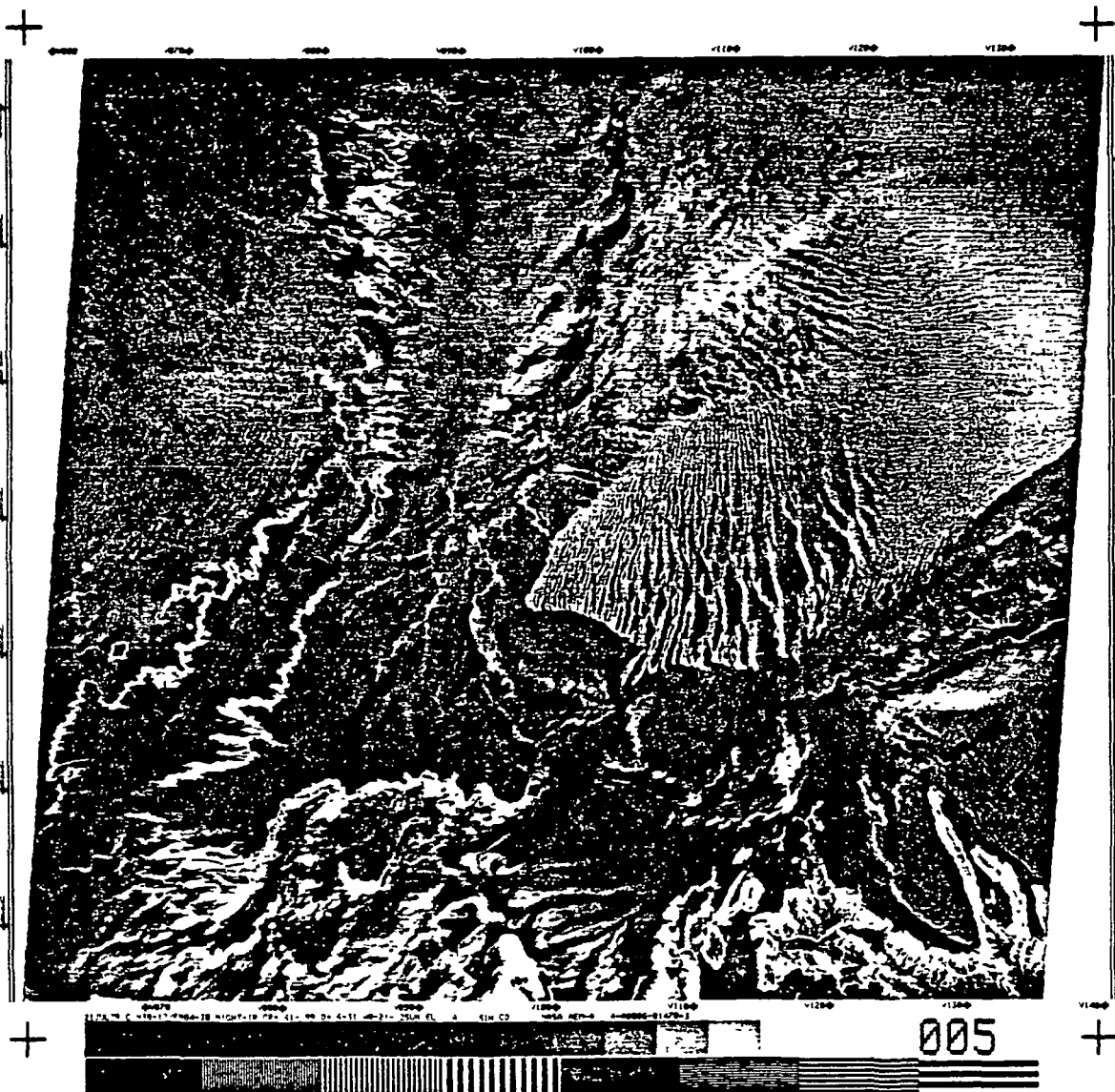
The most striking features are the Grand Erg Occidental and Oriental. The Grand Erg Oriental or Great Eastern Erg is named for the prominent longitudinal dunes. Erg means "desert with dunes" in Arabic.

The repetitive coverage can be used to plot the process of seasonal dune migration and the effect of wind stress on unconsolidated sands. This should be of particular value in the Sahara because migrating dunes are a handicap to the recovery process of subsurface water and oil resource exploitation.

The scale is about 1:4,000,000. (Image courtesy of the National Space Science Data Center.)

Nighttime

Thermal Infrared



This nighttime thermal infrared HCMM image of the Pacific Ocean, central California, and western Nevada was obtained July 17, 1978. In this image, the cooler elements appear as the darkest objects, and the warmer elements as the lightest objects.

This area of the Pacific is biologically highly productive because of upwelling, which is the process by which water rises from a lower to a higher depth, bringing with it renewed nutrients, and is usually a result of divergence and offshore currents. Evidence of upwelling is apparent in this image where the near shore waters are brighter and, therefore, cooler than the offshore coastal waters. Another interesting coastal observation is the turbid plume of water pouring into the Pacific from San Francisco Bay.

The San Andreas fault zone is quite pronounced in this image. This major transcurrent right-lateral strike-slip fault has many associated features. The most conspicuous major structures associated with this fault type are regional fracture systems. They approximately parallel and commonly branch from the main fault. Other features such as drag folds can be attributed to this fault zone. Linearity of features, as observed in this image, may be indicative of such faults or fault zone features.

Several mountain ranges are represented in this scene. The Coast Range, intricately folded metamorphic and marine sedimentary rocks, extends along the Pacific coast. The Sierra Nevadas, a giant, uplifted block, are the very dark colored range. Between the Coast Range and the Sierras, appears the Quaternary sediment-filled Great Valley. The field patterns of this valley are also recognizable.

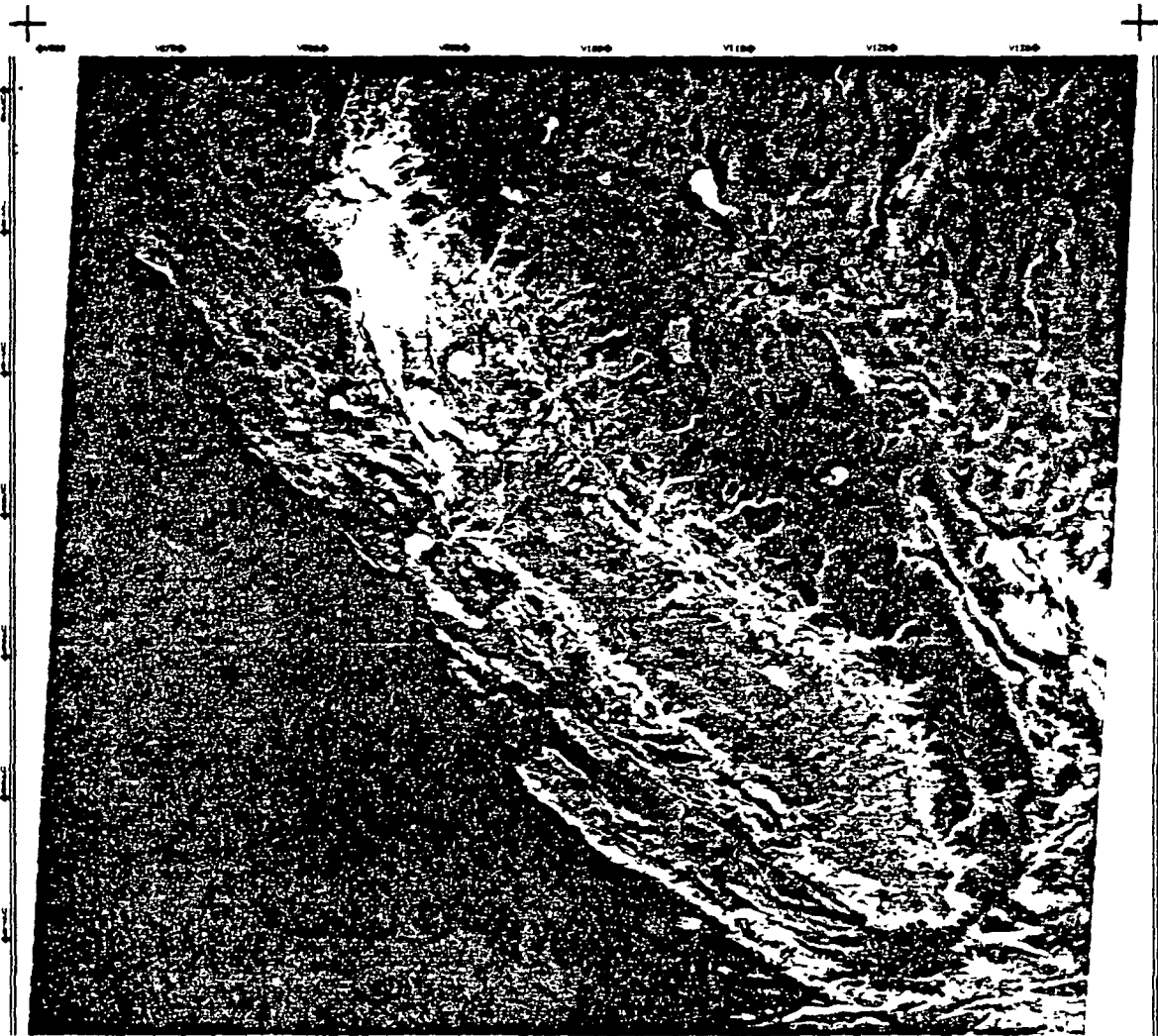
Along the right center edge of the image is the northern end of Death Valley, seen as the band white (hot) color. The northeast flank of the Sierra Nevadas descends abruptly to the Basin and Range province.

This area consists of uplifted mountain blocks with steep-sided, down-faulted valley troughs. Sand and salts, the light colored areas in the upper right corner of the scene, accumulate in alluvial deposits between the mountains.

The scale is about 1:4,000,000. (Images courtesy of the National Space Science Data Center.)



068



069



These daytime HCMM scenes of southern British Columbia, Canada were obtained April 27, 1979. The scene extends from the Pacific Coast through Vancouver Island and Queen Charlotte Sound to the Cascade Mountain Range.

The coastal waters around British Columbia are primarily fjord-like estuaries. From the Strait of Juan de Fuca northward along the Pacific Coast, the shoreline has been greatly modified by glacial action. Glaciers moving down mountain valleys carved gorges hundreds of meters deep and often deposited boulders and clay at the mouth of the valleys.

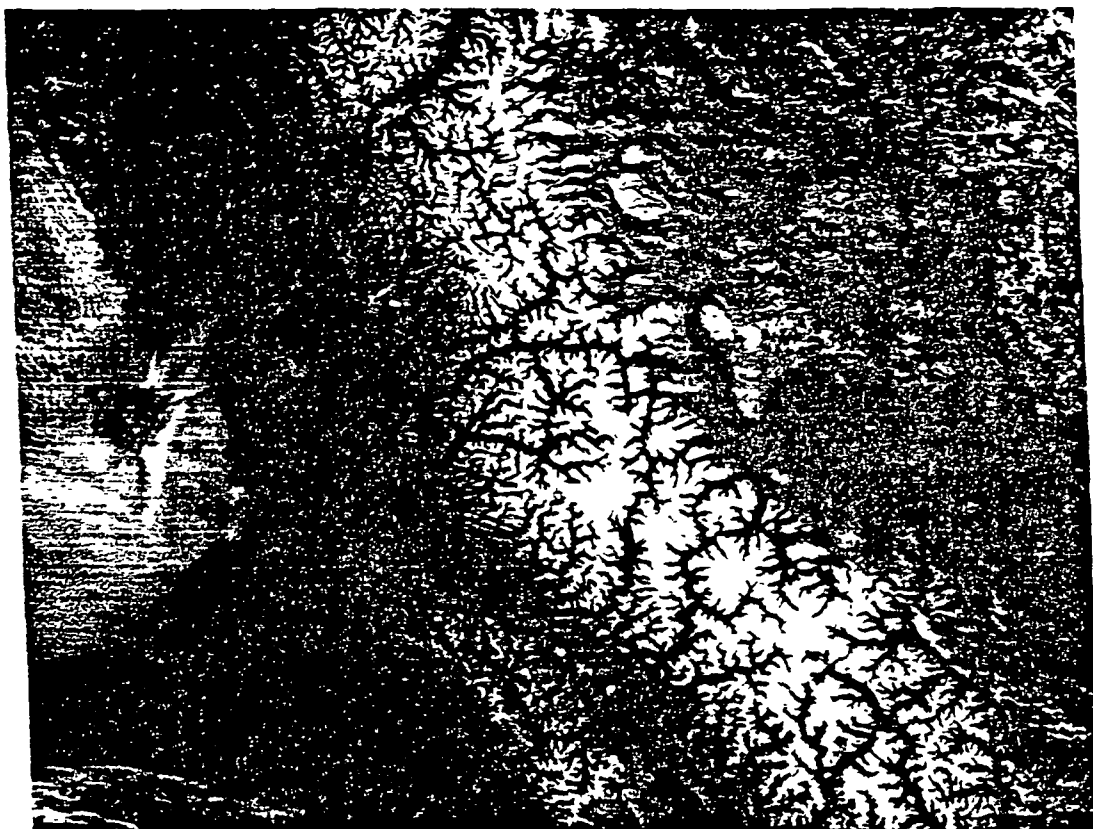
The Cascades are the massive, snow-capped mountain peaks that are vividly exposed in these images. The Cascades are a result of late Cenozoic tectonism. The Cascade Range was the site of folding, local metamorphism, and small granitic batholiths as well as more widespread faulting and volcanism. The Cascade volcanoes represent a young volcanic arc superimposed upon older structures.

In this thermal IR image, the cooler elements appear as the darkest objects, and the warmer elements as the lightest objects. The bright, white passage as seen in the thermal infrared image in the Canadian Rockies corresponds to the Fraser River and Chilcotin River. This also corresponds to a partially cleared farming/grazing area which is a striking contrast to the rugged forested and snow-capped peaks of the Cascades.

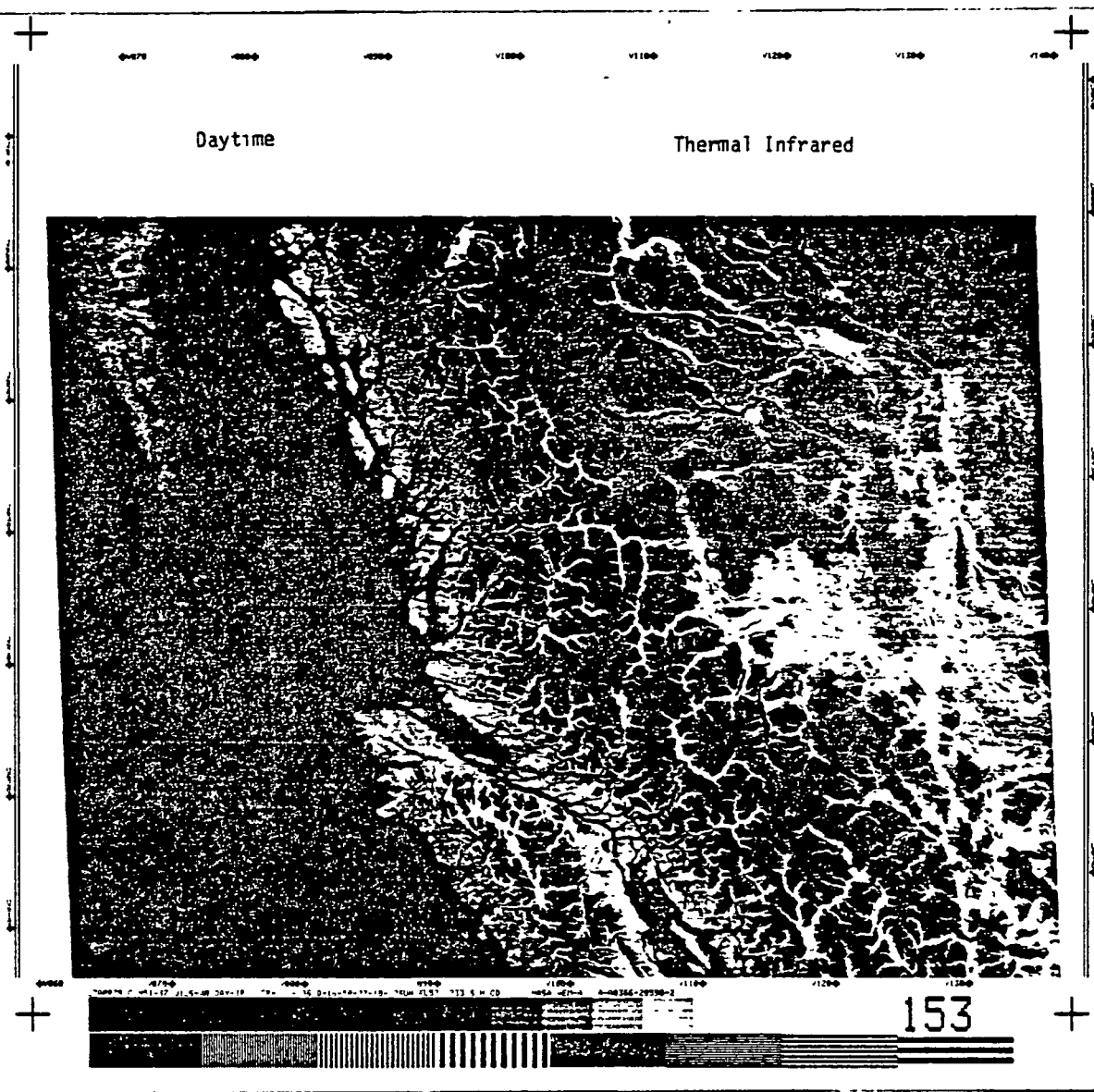
The scale is about 1:4,000,000. (Images courtesy of the National Space Science Data Center.)

Daytime

Visible



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APPENDIX G. EVALUATION RESULTS



National Aeronautics and
Space Administration

Washington, D C
20546

Reply to Attn of

Our office recently supplied you with information concerning the availability of data from NASA's Heat Capacity Mapping Mission (HCMM) satellite. In an effort to determine the effectiveness of this information release program and to plan future release programs, the enclosed questionnaire is being sent to you for completion. It is NASA's intention to disseminate information about the availability of space acquired data to the widest possible community of potential users. Your assistance in helping us evaluate the efficacy of this information release program will be greatly appreciated.

Thank you in advance for your time and effort in responding. If you have any questions or comments, please feel free to contact me directly (202/755-1201).

Sincerely,

A handwritten signature in black ink that reads "Mark Settle".

Mark Settle
Program Scientist
Non-Renewable Resources Program

PUBLIC INFORMATION RELEASE
FOR
HEAT CAPACITY MAPPING MISSION

1. Was the information relevant to your area(s) of interest? Yes ☐ No ☐
2. Was the information of sufficient detail and interest? Yes ☐ No ☐
3. How was the information used? Journal/Newsletter Article ☐
Journal/Newsletter Journal ☐
Other ☐
Describe _____
4. Have you received comments from your readers/members? Yes ☐ No ☐
5. What have been the comments concerning this information? Favorable ☐
Mixed ☐
Unfavorable ☐
6. Would you wish to receive future information releases of a similar nature? Yes ☐ No ☐
7. Any additional comments?

EVALUATION RESULTS

	Favorable Response	Negative Response	No Comment
Journals (Total of 36 with a 25% response)	67%	22%	11%
Societies (Total of 38 with a 37% response)	79%	14%	7%
Total Mailings (74 with a 31% response)	74%	17%	9%

Questionnaire Results

This table shows the breakdown of those questionnaires returned. The "No Comment" column does not refer to questionnaires not returned. It does refer, however, to the few questionnaires returned unanswered with a note such as "Please refer all future HCMM correspondence to..." or "Information and material forwarded to... for evaluation."

REQUESTS FOR HCMM DATA FROM THE NSSDC

TOTAL REQUESTS FILLED

